

General

Guideline Title

European guidelines on cardiovascular disease prevention in clinical practice (version 2012).

Bibliographic Source(s)

Perk J, De Backer G, Gohlke H, Graham I, Reiner Z, Verschuren M, Albus C, Benlian P, Boysen G, Cifkova R, Deaton C, Ebrahim S, Fisher M, Germano G, Hobbs R, Hoes A, Karadeniz S, Mezzani A, Prescott E, Ryden L, Scherer M, Syvanne M, Scholte op Reimer WJ, Vrints C, Wood D, Zamorano JL, Zannad F. European guidelines on cardiovascular disease prevention in clinical practice (version 2012). *Eur Heart J*. 2012 Jul;33(13):1635-701. [568 references] [PubMed](#)

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Graham I, Atar D, Borch-Johnsen K, Boysen G, Burell G, Cifkova R, Dallongeville J, De Backer G, Ebrahim S, Gjelsvik B, Herrmann-Lingen C, Hoes A, Humphries S, Knapton M, Perk J, Priori SG, Pyorala K, Reiner Z, Ruilope L, Sans-Menendez S, Op Reimer WS, Weissberg P, Wood D, Yamell J, Zamorano JL, Walma E, Fitzgerald T, Cooney MT, Dudina A, Vahanian A, Camm J, De Caterina R, Dean V, Dickstein K, Funck-Brentano C, Filippatos G, Hellems I, Kristensen SD, McGregor K, Sechtem U, Silber S, Tendera M, Widimsky P, Zamorano JL, Altiner A, Bonora E, Durrington PN, Fagard R, Giampaoli S, Hemingway H, Hakansson J, Kjeldsen SE, Larsen L, Mancina G, Manolis AJ, Orth-Gomér K, Pedersen T, Rayner M, Ryden L, Sammut M, Schneiderman N, Stalenhoef AF, Tokgozoglu L, Wiklund O, Zampelas A, European Society of Cardiology (ESC), European Association for Cardiovascular Prevention and Rehabilitation (EACPR), Council on Cardiovascular Nursing, European Association for Study of Diabetes (EASD), International Diabetes Federation Europe (IDF-Europe), European Stroke Initiative (EUSI), International Society of Behavioural Medicine (ISBM), European Society of Hypertension (ESH), WONCA Europe (European Society of General Practice/Family Medicine), European Heart Network (EHN), European Atherosclerosis Society (EAS). European guidelines on cardiovascular disease prevention in clinical practice: full text. Fourth Joint Task Force of the European Society of Cardiology and other societies [trunc]. *Eur J Cardiovasc Prev Rehabil* 2007 Sep;(14 Suppl 2):S1-113.

Recommendations

Major Recommendations

Note from the National Guideline Clearinghouse (NGC): The original guideline document differs from 2007 guidelines in several ways: there is a greater focus on new scientific knowledge. The use of grading systems (European Society of Cardiology [ESC] and Grading of Recommendations Assessment, Development, and Evaluation [GRADE]) allows more evidence-based recommendations to be adapted to the needs of clinical practice.

The class of recommendations (I-III), levels of evidence (A-C) and categories of GRADE recommendation (strong and weak) are defined at the end of the "Major Recommendations" field.

Why Is Prevention of Cardiovascular Disease Needed?

Key Messages

- Atherosclerotic cardiovascular disease (CVD), especially coronary heart disease (CHD), remains the leading cause of premature death worldwide.
- CVD affects both men and women; of all deaths that occur before the age of 75 years in Europe, 42% are due to CVD in women and 38% in men.
- CVD mortality is changing, with declining age-standardized rates in most European countries, which remain high in Eastern Europe.
- Prevention works: >50% of the reductions seen in CHD mortality relate to changes in risk factors, and 40% to improved treatments.
- Preventive efforts should be lifelong, from birth (if not before) to old age.
- Population and high-risk preventive strategies should be complementary; an approach limited to high-risk persons will be less effective; population education programmes are still needed.
- Despite gaps in our understanding, there is ample evidence to justify intensive public health and individual preventive efforts.
- There is still substantial room for improvement in risk factor control, even in individuals at very high risk.

Who Should Benefit from It?

Strategies and Risk Estimation

*Key Messages**

- In apparently healthy persons, CVD risk is most frequently the result of multiple interacting risk factors.
- A risk estimation system such as Systematic Coronary Risk Evaluation Project (SCORE) can assist in making logical management decisions, and may help to avoid both under- and overtreatment.
- Certain individuals are at high CVD risk without needing risk scoring and require immediate intervention for all risk factors.
- In younger persons, a low absolute risk may conceal a very high relative risk, and use of the relative risk chart or calculation of their 'risk age' may help in advising them of the need for intensive lifestyle efforts.
- While women appear to be at lower CVD risk than men, this is misleading as risk is deferred by ~10 years rather than avoided.
- All risk estimation systems are relatively crude and require attention to qualifying statements.
- Additional factors affecting risk can be accommodated in electronic risk estimation systems such as HeartScore (www.heartscore.org).
- The total risk approach allows flexibility: if perfection cannot be achieved with one risk factor, risk can still be reduced by trying harder with others.

*The detailed SCORE charts with integrated high-density lipoprotein (HDL)-cholesterol values can be found on the [ESC Web site](#) in the related materials section.

Recommendations Regarding Risk Estimation

Total risk estimation using multiple risk factors (such as SCORE) is recommended for asymptomatic adults without evidence of CVD. (Class of recommendation I, level of evidence C, GRADE rating Strong) (Mosca et al., 2007)

High-risk individuals can be detected on the basis of established CVD, diabetes mellitus, moderate to severe renal disease, very high levels of individual risk factors, or a high SCORE risk, and are a high priority for intensive advice about all risk factors. (Class of recommendation I, level of evidence C, GRADE rating Strong) (Mosca et al., 2007; Graham et al., 2007)

Genetics

Key Message

- The importance of the familial prevalence of early-onset CVD is not yet sufficiently understood in clinical practice.

Recommendations for Genetic Testing

Deoxyribonucleic acid (DNA)-based tests for common genetic polymorphisms do not presently add significantly to diagnosis, risk prediction, or patient management and cannot be recommended. (Class of recommendation III, level of evidence B, GRADE rating Strong) (Botkin, 2010)

The added value of genotyping, as an alternative or in addition to phenotyping, for a better management of risk and early prevention in relatives, cannot be recommended. (Class of recommendation III, level of evidence B, GRADE rating Strong) (Paynter et al., 2010)

Age and Gender

Key Messages

- CVD is by far the biggest cause of death in women.
- The risk of CVD in women, as in men, can be reduced by not smoking, by being active, avoiding overweight, and by having a blood pressure and blood cholesterol check (and intervention, if elevated).

Recommendation Regarding Age and Gender

Women and older people should be included in CVD risk assessments in the same way as other groups to determine need for specific treatments. (Class of recommendation I, level of evidence B, GRADE rating Strong) (Jousilahti et al., 1999; Rayner et al., 2009)

Psychosocial Risk Factors

Key Messages

- Low socio-economic status, lack of social support, stress at work and in family life, depression, anxiety, hostility, and the type D personality contribute both to the risk of developing CVD and the worsening of clinical course and prognosis of CVD.
- These factors act as barriers to treatment adherence and efforts to improve lifestyle, as well as to promoting health and well-being in patients and populations. In addition, distinct psychobiological mechanisms have been identified, which are directly involved in the pathogenesis of CVD.

Recommendation Regarding Psychosocial Factors

Psychosocial risk factors should be assessed by clinical interview or standardized questionnaires. Tailored clinical management should be considered in order to enhance quality of life and CHD prognosis. (Class of recommendation IIa, level of evidence B, GRADE rating Strong) (Rollman et al., 2009; Davidson et al., 2010; Katon et al., 2010)

Other Biomarkers of Risk

Key Messages

- Novel biomarkers have only limited additional value when added to CVD risk assessment with the SCORE algorithm.
- High-sensitivity C-reactive protein (CRP) and homocysteine may be used in persons at moderate CVD risk.

Recommendations for Inflammatory Biomarkers

High-sensitivity CRP may be measured as part of refined risk assessment in patients with an unusual or moderate CVD risk profile. (Class of recommendation IIb, level of evidence B, GRADE rating Weak) (Berger et al., 2010)

High-sensitivity CRP should not be measured in asymptomatic low-risk individuals and high-risk patients to assess 10-year risk of CVD. (Class of recommendation III, level of evidence B, GRADE rating Strong) (Emerging Risk Factors Collaboration et al., 2010)

Fibrinogen may be measured as part of refined risk assessment in patients with an unusual or moderate CVD risk profile. (Class of recommendation IIb, level of evidence B, GRADE rating Weak) (Fibrinogen Studies Collaboration et al., 2007)

Fibrinogen should not be measured in asymptomatic low-risk individuals and high-risk patients to assess 10-year risk of CVD. (Class of recommendation III, level of evidence B, GRADE rating Strong) (Fibrinogen Studies Collaboration et al., 2007)

Recommendations for Thrombotic Biomarkers

Homocysteine may be measured as part of a refined risk assessment in patients with an unusual or moderate CVD risk profile. (Class of recommendation IIb, level of evidence B, GRADE rating Weak) (Clarke et al., 2010)

Homocysteine should not be measured to monitor CVD risk prevention. (Class of recommendation III, level of evidence B, GRADE rating Strong) (Clarke et al., 2010)

Lipoprotein-associated phospholipase 2 (LpPLA2) may be measured as part of a refined risk assessment in patients at high risk of a recurrent acute atherothrombotic event. (Class of recommendation IIb, level of evidence B, GRADE rating Weak) (Garza et al., 2007)

Imaging Methods in Cardiovascular Disease Prevention

Key Message

- Imaging methods can be relevant in CVD risk assessment in individuals at moderate risk.

Recommendations Regarding Imaging Methods

Measurement of carotid intima-media thickness and/or screening for atherosclerotic plaques by carotid artery scanning should be considered for cardiovascular risk assessment in asymptomatic adults at moderate risk. (Class of recommendation IIa, level of evidence B, GRADE rating Strong) (O'Leary et al., 1999; Chambless et al., 1997; Sramek et al., 2000)

Measurement of ankle-brachial index should be considered for cardiovascular risk assessment in asymptomatic adults at moderate risk. (Class of recommendation IIa, level of evidence B, GRADE rating Strong) (Hiatt, 2001; McDermott et al., 2002; Vogt et al., 1993)

Computed tomography for coronary calcium should be considered for cardiovascular risk assessment in asymptomatic adults at moderate risk. (Class of recommendation IIa, level of evidence B, GRADE rating Weak) (Schiffrin, Lipman, & Mann, 2007; Van Werkhoven et al., 2009; Mollmann et al., 2011)

Exercise electrocardiography may be considered for cardiovascular risk assessment in moderate-risk asymptomatic adults (including sedentary adults considering starting a vigorous exercise programme), particularly when attention is paid to non-electrocardiogram markers such as exercise capacity. (Class of recommendation IIb, level of evidence B, GRADE rating Strong) (Aktas et al., 2004; Gibbons et al., 2003; Kodama et al., 2009)

Other Diseases with Increased Risk for Cardiovascular Disease

Recommendations Regarding Other Diseases with Increased Risk for Cardiovascular Disease

In patients with chronic kidney disease, risk factors have to be attended to in the same way as for very high-risk persons. (Class of recommendation I, level of evidence C, GRADE rating Strong) (Fox et al., 2010; Colhoun et al., 2004)

All persons with obstructive sleep apnoea should undergo medical assessment, including risk stratification and risk management. (Class of recommendation IIa, level of evidence A, GRADE rating Strong) (Gottlieb et al., 2010; Cassar et al., 2007)

All men with erectile dysfunction should undergo medical assessment, including risk stratification and risk management. (Class of recommendation IIa, level of evidence B, GRADE rating Strong) (Gupta et al., 2011)

How Can Cardiovascular Disease Prevention Be Used?

Principles of Behaviour Change

Key Message

- Cognitive-behavioural methods are effective in supporting persons in adopting a healthy lifestyle.

Recommendations for Behavioural Change

Established cognitive-behavioural strategies (e.g., motivational interviewing) to facilitate lifestyle change are recommended. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Dusseldorp et al., 1999; Rubak et al., 2005)

Specialized healthcare professionals (e.g., nurses, dieticians, psychologists, etc.) should be involved whenever necessary and feasible. (Class of recommendation IIa, level of evidence A, GRADE rating Strong) (Gelfand et al., 2006; Clark et al., 2005; Auer et al., 2008)

In individuals at very high CVD risk, multimodal interventions, integrating education on healthy lifestyle and medical resources, exercise training, stress management, and counselling on psychosocial risk factors are recommended. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Dusseldorp et al., 1999; Clark et al., 2005; Linden, Phillips, & Leclerc, 2007; Rees et al., 2004)

Smoking

Key Messages

- Changing smoking behaviour is a cornerstone of improved CVD health.
- Public health measures including smoking bans are crucial for the public's perception of smoking as an important health hazard.

Recommendations Regarding Smoking

All smoking is a strong and independent risk factor for CVD and has to be avoided. (Class of recommendation I, level of evidence B, GRADE rating Strong) (Doll et al., 1994; Thun et al., 1997)

Exposure to passive smoking increases risk of CVD and has to be avoided. (Class of recommendation I, level of evidence B, GRADE rating Strong) (He et al., 1999; Lightwood & Glantz, 2009)

Young people have to be encouraged not to take up smoking. (Class of recommendation I, level of evidence C, GRADE rating Strong) (Centers for Disease Control and Prevention, 2010)

All smokers should be given advice to quit and be offered assistance. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Lancaster & Stead, 2004; Stead et al., 2008)

Nutrition

Key Messages

- A healthy diet has the following characteristics:
 - Saturated fatty acids to account for <10% of total energy intake, through replacement by polyunsaturated fatty acids
 - Trans-unsaturated fatty acids: as little as possible, preferably no intake from processed food, and <1% of total energy intake from natural origin
 - <5 g of salt per day
 - 30–45 g of fibre per day, from wholegrain products, fruits, and vegetables
 - 200 g of fruit per day (2–3 servings)
 - 200 g of vegetables per day (2–3 servings)
 - Fish at least twice a week, one of which to be oily fish
 - Consumption of alcoholic beverages should be limited to two glasses per day (20 g/day of alcohol) for men and one glass per day (10 g/day of alcohol) for women
- Energy intake should be limited to the amount of energy needed to maintain (or obtain) a healthy weight, i.e., a body mass index (BMI) <25 kg/m².
- In general, when following the rules for a healthy diet, no dietary supplements are needed.

Recommendation Regarding Nutrition

A healthy diet is recommended as being the cornerstone of CVD prevention. (Class of recommendation I, level of evidence B, GRADE rating Strong) (Astrup et al., 2011; He et al., 2004; Mozaffarian et al., 2006; Dauchet et al., 2006; He, Nowson, & MacGregor, 2006; Corrao et al., 2004; Sofi et al., 2010)

Physical Activity

Key Message

- Participation in regular physical activity and/or aerobic exercise training is associated with a decrease in cardiovascular mortality.

Recommendations Regarding Physical Activity

Healthy adults of all ages should spend 2.5–5 h a week on physical activity or aerobic exercise training of at least moderate intensity, or 1–2.5 h a week on vigorous intense exercise. Sedentary subjects should be strongly encouraged to start light-intensity exercise programmes. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Talbot et al., 2007; Nocon et al., 2008; Lollgen, Bockenhoff, & Knapp, 2009; Schnohr, Scharling, & Jensen, 2007)

Physical activity/aerobic exercise training should be performed in multiple bouts each lasting ≥10 min and evenly spread throughout the week, i.e., on 4–5 days a week. (Class of recommendation IIa, level of evidence A, GRADE rating Strong) (Talbot et al., 2007; Nocon et al., 2008; Lollgen, Bockenhoff, & Knapp, 2009; Schnohr, Scharling, & Jensen, 2007)

Patients with previous acute myocardial infarction, coronary artery bypass graft (CABG), percutaneous coronary intervention (PCI), stable angina pectoris, or stable chronic heart failure should undergo moderate-to-vigorous intensity aerobic exercise training ≥3 times a week and 30 min per session. Sedentary patients should be strongly encouraged to start light-intensity exercise programmes after adequate exercise-related risk stratification. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Taylor et al., 2004; Piepoli et al., 2004)

Key Message

- Psychological interventions can counteract psychosocial stress and promote healthy behaviours and lifestyle.

Recommendations on the Management of Psychosocial Factors

Multimodal behavioural interventions, integrating health education, physical exercise, and psychological therapy for psychosocial risk factors and coping with illness, should be prescribed. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Dusseldorp et al., 1999; Clark et al., 2005; Auer et al., 2008; Linden, Phillips, & Leclerc, 2007; Rees et al., 2004)

In the case of clinically significant symptoms of depression, anxiety, and hostility, psychotherapy, medication, or collaborative care should be considered. This approach can reduce mood symptoms and enhance health-related quality of life, although evidence for a definite beneficial effect on cardiac endpoints is inconclusive. (Class of recommendation IIa, level of evidence A, GRADE rating Strong) (Davidson et al., 2010; Katon et al., 2010; Linden, Phillips, & Leclerc, 2007; Rees et al., 2004; Whalley et al., 2011; Schneiderman et al., 2004; Taylor et al., 2005; Carney et al., 2004; Sauer, Berlin, & Kimmel, 2003)

Body Weight

Key Messages

- Both overweight and obesity are associated with a risk of death in CVD. (Prospective Studies Collaboration et al., 2009; Berrington de Gonzalez et al., 2010; Zheng et al., 2011)
- There is a positive linear association of BMI with all-cause mortality. (Prospective Studies Collaboration et al., 2009)
- All-cause mortality is lowest with a BMI of 20–25 kg/m². (Prospective Studies Collaboration et al., 2009; Berrington de Gonzalez et al., 2010; Zheng et al., 2011)
- Further weight reduction cannot be considered protective against CVD. (Romero-Corral et al., 2006; Oreopoulos et al., 2008; Hastie et al., 2010; Lavie, Milani, & Ventura, 2009)

Recommendation Regarding Body Weight

Weight reduction in overweight and obese people is recommended as this is associated with favourable effects on blood pressure and dyslipidaemia, which may lead to less CVD. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Prospective Studies Collaboration et al., 2009; Berrington de Gonzalez et al., 2010; Zheng et al., 2011)

Blood Pressure

Key Message

- Elevated blood pressure (BP) is a major risk factor for CHD, heart failure, cerebrovascular disease, peripheral artery disease (PAD), renal failure, and atrial fibrillation.

Recommendations on Blood Pressure

Lifestyle measures such as weight control, increased physical activity, alcohol moderation, sodium restriction, and increased consumption of fruits, vegetables, and low-fat dairy products are recommended in all patients with hypertension and in individuals with high normal BP. (Class of recommendation I, level of evidence B, GRADE rating Strong) (He, Nowson, & MacGregor, 2006; Sacks et al., 2001; Neter et al., 2003; Cornelissen et al., 2011; McFadden et al., 2005; He & MacGregor, 2011)

All major antihypertensive drug classes (i.e., diuretics, angiotensin-converting enzyme [ACE] inhibitors, calcium antagonists, angiotensin receptor antagonists, and beta-blockers) do not differ significantly in their BP-lowering efficacy and thus should be recommended for the initiation and maintenance of antihypertensive treatment. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Law, Morris, & Wald, 2009)

Beta-blockers and thiazide diuretics are not recommended in hypertensive patients with multiple metabolic risk factors increasing the risk of new-onset diabetes. (Class of recommendation III, level of evidence A, GRADE rating Strong) (Poulter et al., 2005; Elliot & Meyer, 2007)

In patients with diabetes, an ACE inhibitor or a renin–angiotensin receptor blocker is recommended. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Patel et al., 2007; Turnbull et al., 2005; Viberti, Wheeldon & MicroAlbuminuria Reduction With VALsartan

(MARVAL) Study Investigators, 2002)

Risk stratification using the SCORE risk chart is recommended as a minimal requirement in each hypertensive patient. (Class of recommendation I, level of evidence B, GRADE rating Strong) (Conroy et al., 2003; Sehestedt et al., 2010)

However, as there is evidence that subclinical organ damage predicts cardiovascular death independently of SCORE, a search for subclinical organ damage should be encouraged, particularly in individuals at low or moderate risk (SCORE 1–4%). (Class of recommendation IIa, level of evidence B, GRADE rating Weak) (Conroy et al., 2003; Sehestedt et al., 2010)

Drug treatment is recommended to be initiated promptly in patients with grade 3 hypertension, as well as in patients with grade 1 or 2 hypertension who are at high or very high total cardiovascular risk. (Class of recommendation I, level of evidence C, GRADE rating Strong) (Mancia et al., 2007)

In patients with grade 1 or 2 hypertension and at moderate total cardiovascular risk, drug treatment may be delayed for several weeks, and in grade 1 hypertensive patients without any other risk factor, for several months while trying lifestyle measures. (Class of recommendation IIb, level of evidence C, GRADE rating Weak) (Mancia et al., 2007)

Systolic BP should be lowered to <140 mmHg (and diastolic BP <90 mmHg) in all hypertensive patients. (Class of recommendation IIa, level of evidence A, GRADE rating Strong) (Zanchetti, Grassi, & Mancia, 2009; Liu et al., 2005; Weber et al., 2004)

All hypertensive patients with established cardiovascular disease, or with type 2 diabetes, or with an estimated 10-year risk of cardiovascular death $\geq 5\%$ (based on the SCORE chart) should be considered for statin therapy. (Class of recommendation IIa, level of evidence B, GRADE rating Strong) (Blackburn et al., 2007)

Antiplatelet therapy, in particular low-dose aspirin, is recommended for hypertensive patients with cardiovascular events. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Turnbull et al., 2005)

Antiplatelet therapy may be considered in hypertensive patients without a history of cardiovascular disease, but with reduced renal function or at high cardiovascular risk. (Class of recommendation IIb, level of evidence A, GRADE rating Weak) (Zanchetti et al., 2002; Ruilope et al., 2001; Jardine et al., 2010)

Treatment Targets in Patients with Type 2 Diabetes

Key Messages

- Intensive management of hyperglycaemia in diabetes reduces the risk of microvascular complications and, to a lesser extent, that of cardiovascular disease.
- Intensive treatment of BP in diabetes reduces the risk of macrovascular and microvascular outcomes.
- Multiple antihypertensive drugs are usually required to reach the target.

Recommendations on Diabetes Mellitus

The target glycated haemoglobin (HbA_{1c}) for the prevention of CVD in diabetes of <7.0% (<53 mmol/mol) is recommended. (Class of recommendation I, level of evidence A, GRADE rating Strong) (U.K. Prospective Diabetes Study [UKPDS] Group, "Intensive blood-glucose control," 1998; ADVANCE Collaborative Group et al., 2008)

Statins are recommended to reduce cardiovascular risk in diabetes. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Colloun et al., 2004; Collins et al., 2003)

Hypoglycaemia and excessive weight gain must be avoided and individual approaches (both targets and drug choices) may be necessary in patients with complex disease. (Class of recommendation I, level of evidence B, GRADE rating Strong) (ADVANCE Collaborative Group et al., 2008; Heidenreich et al., 2011; Duckworth et al., 2009)

Metformin should be used as first-line therapy if tolerated and not contraindicated. (Class of recommendation IIa, level of evidence B, GRADE rating Strong) ("Effect of intensive blood-glucose control," 1998)

Further reductions in HbA_{1c} to a target of <6.5% (<48 mmol/mol) (the lowest possible safely reached HbA_{1c}) may be useful at diagnosis. For patients with a long duration of diabetes this target may reduce risk of microvascular outcomes. (Class of recommendation IIb, level of evidence B, GRADE rating Weak) (ADVANCE Collaborative Group et al., 2008)

BP targets in diabetes are recommend to be <140/80 mmHg. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Hansson et al., 1998; UKPDS Group, "Tight blood pressure control," 1998)

Target LDL cholesterol is <2.5 mmol/L, for patients without atherosclerotic disease total cholesterol may be <4.5 mmol/L, with a lower LDL cholesterol target of <1.8 mmol/L (using higher doses of statins) for diabetic patients at very high CVD risk. (Class of recommendation IIb, level of evidence B, GRADE rating Weak) (Shepherd et al., 2006)

Antiplatelet therapy with aspirin is not recommended for people with diabetes who do not have clinical evidence of atherosclerotic disease. (Class of recommendation III, level of evidence A, GRADE rating Strong) (De Berardis et al., 2009)

Lipids

Key Messages

- Increased plasma cholesterol and LDL cholesterol are among the main risk factors for CVD.
- Hypertriglyceridaemia and low HDL cholesterol are independent CVD risk factors.
- Statin therapy has a beneficial effect on atherosclerotic CVD outcomes.

Recommendations on Management of Hyperlipidaemia

The recommended target levels are <5 mmol/L (less than ~190 mg/dL) for total plasma cholesterol and <3 mmol/L (less than ~115 mg/dL) for LDL cholesterol for subjects at low or moderate risk. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Neaton et al., 1992; Smith et al., 1992)

In patients at high CVD risk, an LDL cholesterol goal <2.5 mmol/L (less than ~100 mg/dL) is recommended. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Cholesterol Treatment Trialists' [CTT] Collaboration et al., 2010; Brugs et al., 2009; Mills et al., 2008)

In patients at very high CVD risk, the recommended LDL cholesterol target is <1.8 mmol/L (less than ~70 mg/dL) or a ≥50% LDL cholesterol reduction when the target level cannot be reached. (Class of recommendation I, level of evidence A, GRADE rating Strong) (CTT Collaboration et al., 2010; Pedersen et al., 2005; LaRosa et al., 2005)

All patients with familial hypercholesterolaemia must be recognized as high-risk patients and be treated with lipid-lowering therapy. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Neil et al., 2008; Jensen, Blankenhorn, & Komerup, 1967)

In patients with an acute coronary syndrome (ACS), statin treatment in high doses has to be initiated while the patients are in hospital. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Schwartz et al., 2001; Ray et al., 2005; de Lemos et al., 2004)

Prevention of non-haemorrhagic stroke: treatment with statins must be started in all patients with established atherosclerotic disease and in patients at high risk for developing CVD. Treatment with statins must be started in patients with a history of non-cardioembolic ischaemic stroke. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Amarenco & Labreuche, 2009; Byington et al., 2001)

Occlusive arterial disease of the lower limbs and carotid artery disease are CHD risk-equivalent conditions and lipid-lowering therapy is recommended. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Ankle Brachial Index Collaboration et al., 2008; Aung et al., 2007)

Statin should be considered as the first-line drugs in transplant patients with dyslipidaemia. (Class of recommendation IIa, level of evidence B, GRADE rating Strong) (Navaneethan et al., 2009)

Chronic kidney disease (stages 2–5, i.e., glomerular filtration rate [GFR] <90 mL/min/1.73 m²) is acknowledged as a CHD risk-equivalent and the LDL cholesterol target in these patients should be adapted to the degree of renal failure. (Class of recommendation IIa, level of evidence C, GRADE rating Strong) (Sandhu et al., 2006)

Intervention Strategies as a Function of Total Cardiovascular Risk and Low-density Lipoprotein Cholesterol Level

Total CV risk (SCORE) %	LDL-C levels				
	<70 mg/dL <1.8 mmol/L	70 to <100 mg/dL 1.8 to <2.5 mmol/L	100 to <155 mg/dL 2.5 to <4.0 mmol/L	155 to <190 mg/dL 4.0 to <4.9 mmol/L	>190 mg/dL >4.9 mmol/L
<1	No lipid intervention	No lipid intervention	Lifestyle intervention	Lifestyle intervention	Lifestyle intervention, consider drug if

Total CV risk (SCORE) % Class of recommendation/Level of evidence	I/C	I/C	I/C	I/C	uncontrolled IIa/A
	<70 mg/dL <1.8 mmol/L	70 to <100 mg/dL 1.8 to <2.5 mmol/L	LDL-C levels 100 to <155 mg/dL 2.5 to <4.0 mmol/L	155 to <190 mg/dL 4.0 to <4.9 mmol/L	>190 mg/dL >4.9 mmol/L
≥1 to <5	Lifestyle intervention	Lifestyle intervention	Lifestyle intervention, consider drug if uncontrolled	Lifestyle intervention, consider drug if uncontrolled	Lifestyle intervention, consider drug if uncontrolled
Class of recommendation/Level of evidence	I/C	I/C	IIa/A	IIa/A	I/A
>5 to <10, or high risk	Lifestyle intervention, consider drug	Lifestyle intervention, consider drug	Lifestyle intervention and immediate drug intervention	Lifestyle intervention and immediate drug intervention	Lifestyle intervention and immediate drug intervention
Class of recommendation/Level of evidence	IIa/A	IIa/A	IIa/A	I/A	I/A
≥10 or very high risk	Lifestyle intervention, consider drug*	Lifestyle intervention and immediate drug intervention	Lifestyle intervention and immediate drug intervention	Lifestyle intervention and immediate drug intervention	Lifestyle intervention and immediate drug intervention
Class of recommendation/Level of evidence	IIa/A	IIa/A	I/A	I/A	I/A

From: European Association for Cardiovascular Prevention & Rehabilitation, Reiner Z, Catapano AL, De Backer G, Graham I, Taskinen MR, Wiklund O, Agewall S, Alegria E, Chapman MJ, Durrington P, Erdine S, Halcox J, Hobbs R, Kjekshus J, Filardi PP, Riccardi G, Storey RF, Wood D, Bax J, Vahanian A, Auricchio A, Baumgartner H, Ceconi C, Dean V, Deaton C, Fagard R, Filippatos G, Funck-Brentano C, Hasdai D, Hoes A, Kearney P, Knuuti J, Kolh P, McDonagh T, Moulin C, Poldermans D, Popescu BA, Sechtem U, Simes PA, Tendera M, Torbicki A, Vardas P, Widimsky P, Windecker S, Berkenboom G, De Graaf J, Descamps O, Gotcheva N, Griffith K, Guida GF, Gulec S, Henkin Y, Huber K, Kesaniemi YA, Lekakis J, Manolis AJ, Marques-Vidal P, Masana L, McMurray J, Mendes M, Pagava Z, Pedersen T, Prescott E, Rato Q, Rosano G, Sans S, Stalenhoef A, Tokgozoglu L, Viigimaa M, Wittekoek ME, Zamorano JL. ESC/EAS Guidelines for the management of dyslipidaemias: The Task Force for the management of dyslipidaemias of the European Society of Cardiology (ESC) and the European Atherosclerosis Society (EAS). Eur Heart J 2011;32:1769–1818.

CV, cardiovascular; LDL-C, low-density lipoprotein; SCORE, systematic coronary risk evaluation project.

Antithrombotics

Recommendations on Antithrombotic Therapy

In the acute phase of coronary artery syndromes and for the following 12 months, dual antiplatelet therapy with a P2Y₁₂ inhibitor (ticagrelor or prasugrel) added to aspirin is recommended unless contraindicated due to factors such as an increased risk of bleeding. (Class of recommendation I, level of evidence B, GRADE rating Strong) (Wiviott et al., 2007; Gurbel et al., 2009; Wallentin et al., 2009)

Clopidogrel (600 mg loading dose, 75 mg daily dose) is recommended for patients who cannot receive ticagrelor or prasugrel. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Chen et al., 2005; Yusuf et al., 2001)

In the chronic phase (>12 months) after myocardial infarction, aspirin is recommended for secondary prevention. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Antithrombotic Trialists' Collaboration, 2002; Antithrombotic Trialists' [ATT] Collaboration et al., 2009)

In patients with non-cardioembolic transient ischaemic attack or ischaemic stroke, secondary prevention with either dipyridamole plus aspirin or clopidogrel alone is recommended. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Sacco et al., 2008; CAPRIE Steering Committee, 1996; Diener et al., 2004; De Schryver, Algra, & van Gijn, 2007)

In the case of intolerance to dipyridamole (headache) or clopidogrel, aspirin alone is recommended. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Antithrombotic Trialists' Collaboration, 2002; ATT Collaboration et al., 2009)

In patients with non-cardioembolic cerebral ischaemic events, anticoagulation is not superior to aspirin and is not recommended. (Class of recommendation III, level of evidence B, GRADE rating Weak) (Mohr et al., 2001; Liu, Counsell, & Sandercock, 2000)

Aspirin or clopidogrel cannot be recommended in individuals without cardiovascular or cerebrovascular disease due to the increased risk of major bleeding. (Class of recommendation III, level of evidence B, GRADE rating Weak) (ATT Collaboration et al., 2009)

Adherence

Key Messages

- Adherence to medication in individuals at high risk and in patients with CVD is still low.
- Several types of interventions are effective in improving medication adherence.

Recommendations on Patients' Adherence

Physicians must assess adherence to medication, and identify reasons for non-adherence in order to tailor further interventions to the individual needs of the patient or person at risk. (Class of recommendation I, level of evidence A, GRADE rating Strong) (Ho, Bryson, & Rumsfeld, 2009; Osterberg & Blaschke, 2005; Kripalani, Yao, & Haynes, 2007)

In clinical practice, reducing dosage demands to the lowest acceptable level is recommended. In addition, repetitive monitoring and feedback should be implemented. If feasible, multisession or combined behavioural interventions should be offered in the case of persistent non-adherence. (Class of recommendation IIa, level of evidence A, GRADE rating Strong) (Kripalani, Yao, & Haynes, 2007)

Refer to Table 19 in the original guideline document for recommendations for promoting medication adherence.

Where Should Programmes Be Offered?

Key Message

- Cardiovascular disease is the single most important cause of death for both men and women and can often be prevented!

Recommendation on Program Provision

Actions to prevent cardiovascular disease should be incorporated into everyone's daily lives, starting in early childhood and continuing throughout adulthood and senescence. (Class of recommendation IIa, level of evidence B, GRADE rating Strong) (Weintraub et al., 2011)

Cardiovascular Disease Prevention in Primary Care: Role of Nurses

Key Message

- Nurse-coordinated prevention programmes are effective across a variety of practice settings.

Recommendation on Nurse-Coordinated Care

Nurse-coordinated prevention programmes should be well integrated into healthcare systems. (Class of recommendation IIa, level of evidence B, GRADE rating Strong) (Wood et al., 2008; Berra, Miller, & Fair, 2006; Berra et al., 2011)

Cardiovascular Disease Prevention in General Practice

Key Messages

- Risk factor screening including the lipid profile may be considered in adult men ≥ 40 years old and in women ≥ 50 years of age or post-menopausal (European Association for Cardiovascular Prevention & Rehabilitation et al., 2011)
- The physician in general practice is the key person to initiate, coordinate, and provide long-term follow-up for CVD prevention (Zhao et al., 2007)

Cardiovascular Disease Prevention in Primary Care: Role of the Cardiologist

Key Messages

- The practicing cardiologist should be the advisor in cases where there is uncertainty over the use of preventive medication or when usual preventive options are difficult to apply (Mosca et al., 2011; Heidenreich et al., 2011; Redberg et al., 2009)
- The practicing cardiologist should regularly review the discharge recommendations of the hospital after a cardiac event or intervention (Mosca et al., 2011; Heidenreich et al., 2011; Redberg et al., 2009)

Primary Care-Based Self-Help Programmes

Recommendation on Self-Help Programmes

Patients with cardiac disease may participate in self-help programmes to increase or maintain awareness of the need for risk factor management, for maintaining physical fitness, or for diligent self-management of oral anticoagulation. (Class of recommendation IIa, level of evidence B, GRADE rating Strong) (Matchar et al., 2010)

Hospital-Based Programmes: Hospital Services

Recommendation on Hospital-Based Programmes

All patients with cardiovascular disease must be discharged from hospital with clear guideline-oriented treatment recommendations to minimize adverse events. (Class of recommendation I, level of evidence B, GRADE rating Strong) (Chow et al., 2010; Bramlage et al., 2010)

Hospital-Based Programmes: Specialized Prevention Centres

Recommendation for Specialized Prevention Centres

All patients requiring hospitalization or invasive intervention after an acute ischaemic event should participate in a cardiac rehabilitation programme to improve prognosis by modifying lifestyle habits and increasing treatment adherence. (Class of recommendation IIa, level of evidence B, GRADE rating Strong) (Piepoli et al., 2010; Chow et al., 2010)

Non-governmental Organization Programmes

Key Message

- Non-governmental organizations are important partners to healthcare workers in promoting preventive cardiology.

Action at the European Political Level

Key Message

- The European Heart Health Charter marks the start of a new era of political engagement in preventive cardiology.

Definitions:

Levels of Evidence (European Society of Cardiology [ESC] System)

Level of Evidence A	Data derived from multiple randomized clinical trials or meta-analyses.
Level of Evidence B	Data derived from a single randomized clinical trial or large non-randomized studies.
Level of Evidence C	Consensus of opinion of the experts and/or small studies, retrospective studies, registries.

Classes of Recommendations (ESC System)

Classes of Recommendations	Definition	Suggested Wording to Use
Class I	Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective.	Is recommended/is indicated
Class II	Conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of the given treatment or procedure.	
<i>Class IIa</i>	<i>Weight of evidence/opinion is in favour of usefulness/efficacy.</i>	Should be considered
<i>Class IIb</i>	<i>Usefulness/efficacy is less well established by evidence/opinion.</i>	May be considered
Class III	Evidence or general agreement that the given treatment or procedure is not useful/effective, and in some cases may be harmful.	Is not recommended

Strength of Recommendation (Grading of Recommendations Assessment, Development, and Evaluation [GRADE] System)

Strong recommendation - Most informed patients would choose the recommended intervention (and request discussion if not offered); clinicians would ensure that most patients should receive the intervention; and the recommendation would be adopted as policy in organized healthcare

systems.

Weak recommendation - Some patients would want the intervention but many would not; clinicians would help patients make choices dependent on their values and preferences; policy makers would require debate among various stakeholders to decide on the role of the intervention.

Clinical Algorithm(s)

The Modified World Health Organization (WHO) smoking cessation algorithm is provided in the original guideline document.

Scope

Disease/Condition(s)

Cardiovascular disease, including coronary heart disease, stroke, peripheral artery disease and their complications

Guideline Category

Counseling

Evaluation

Management

Prevention

Risk Assessment

Clinical Specialty

Cardiology

Family Practice

Geriatrics

Internal Medicine

Nutrition

Preventive Medicine

Intended Users

Advanced Practice Nurses

Dietitians

Health Care Providers

Nurses

Physicians

Psychologists/Non-physician Behavioral Health Clinicians

Guideline Objective(s)

To give an update of the present knowledge in preventive cardiology for physicians and other health workers

Target Population

- European patients with established cardiovascular disease (CVD)
- Asymptomatic individuals in Europe who are at increased risk of CVD mortality
- First-degree relatives of Europeans with premature CVD
- Other individuals encountered in routine clinical practice

Interventions and Practices Considered

Risk Assessment/Diagnosis/Evaluation

1. Risk estimation using the Systematic Coronary Risk Evaluation (SCORE) risk prediction system, considering age, gender, smoker status, systolic blood pressure, and cholesterol level
2. Genetic testing (not recommended)
3. Risk assessment in women and older people
4. Assessment of psychosocial risk factors
5. Measurement of inflammatory and thrombotic biomarkers (high-sensitivity C-reactive protein [CRP], homocysteine, fibrinogen, lipoprotein-associated phospholipase 2 [LpPLA2])
6. Imaging studies, including carotid artery scanning, measurement of ankle-brachial index, computed tomography for coronary calcium, exercise electrocardiography
7. Risk assessment and stratification in patients with chronic kidney disease, obstructive sleep apnoea, and erectile dysfunction

Management/Prevention

1. Use of cognitive/behavioural methods to support adoption of a healthy lifestyle
2. Lifestyle interventions
 - Smoking cessation
 - Healthy diet
 - Increased physical activity
 - Management of psychosocial factors
 - Weight reduction
3. Management of hypertension
 - Lifestyle measures
 - Antihypertensive drug treatment (diuretics, angiotensin-converting enzyme [ACE] inhibitors, calcium antagonists, angiotensin receptor antagonists, and beta-blockers)
 - Risk stratification using SCORE
 - Antiplatelet therapy
4. Management of type 2 diabetes
 - Targeted glycated haemoglobin (HbA_{1c})
 - Statins
 - Avoiding hypoglycaemia and excessive weight gain
 - Metformin as first-line therapy
 - Establishing targets for blood pressure and low-density lipoprotein (LDL)-cholesterol levels
5. Management of hyperlipidaemia
 - Establishing target levels of total plasma cholesterol and LDL-cholesterol
 - Intervention strategies based on total cardiovascular risk and LDL-cholesterol level
 - Statins
 - Lifestyle interventions
6. Antithrombotic therapy
 - Dual antiplatelet therapy with a P2Y₁₂ inhibitor added to aspirin

- Clopidogrel
- Dipyridamole plus aspirin
- Aspirin alone

7. Interventions to ensure medication adherence

8. Cardiovascular disease prevention programmes

- Nurse-coordinated care
- Role of physician in general practice
- Role of cardiologist
- Primary care-based self-help programmes
- Hospital-based programmes
- Non-governmental organization programmes

Major Outcomes Considered

- Cardiovascular disease morbidity and mortality
- All-cause mortality
- Survival rate
- Quality of life
- Risk of myocardial infarction, stroke, and coronary heart disease

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

PubMed, Medline, Scopus, EMBASE, and Cochrane databases were searched over the 10 previous years. The following specific search terms were used: cardiovascular disease, prevention, risk assessment, risk management, smoking, nutrition, physical activity, psychosocial factors.

Number of Source Documents

Not stated

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Levels of Evidence (European Society of Cardiology [ESC] System)

Level of Evidence A	Data derived from multiple randomized clinical trials or meta-analyses.
Level of Evidence B	Data derived from a single randomized clinical trial or large non-randomized studies.
Level of Evidence C	Consensus of opinion of the experts and/or small studies, retrospective studies, registries.

Quality of Evidence (Grading of Recommendations Assessment, Development, and Evaluation [GRADE] System [adapted])

High quality evidence - Further research is unlikely to change confidence in the estimate of effect.

Moderate, Low, and Very Low quality evidence - Any estimate of effect is very uncertain.

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review

Description of the Methods Used to Analyze the Evidence

Evaluation Methods

The present guidelines follow the quality criteria for development of guidelines, which can be found at the [European Society of Cardiology \(ESC\) Web site](#) .

Experts from the nine organizations performed a comprehensive review and a critical evaluation of diagnostic and therapeutic procedures, including assessment of the risk–benefit ratio. The level of evidence and the strength of recommendation of particular treatment options were weighed and graded according to the ESC recommendations (see the "Rating Scheme for the Strength of the Evidence" and the "Rating Scheme for the Strength of the Recommendations" fields).

Combining Evaluation Methods

An important novelty in reviewing quality of evidence and making recommendations is the use of both the ESC-recommended method of evaluation and the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) rating system. In contrast to the 2007 guidelines, the Joint Task Force (JTF) has chosen to provide guidance with both systems so that readers acquainted with the former method and those preferring GRADE will find their individually adapted but still congruent guidance in the combined recommendation tables.

The JTF introduced GRADE as it uses a transparent and rigorous process to assess the quality of evidence in terms of whether further research would or would not change confidence in the estimate of intervention effects or diagnostic accuracy. Specific quality indicators are: study limitations, inconsistency of findings, indirectness of evidence, imprecision, and publication bias (see Table 3 in the original guideline document). These are applied to each outcome of critical importance for decision-making in the judgement of the guideline group (e.g., reduction in clinical events is usually critical; changes in biochemical values are not usually critical). Judgements are then made on these indicators to rate evidence quality from *high* (i.e., further research is unlikely to change confidence in the estimate of effect), to *moderate*, *low*, and *very low* (i.e., any estimate of effect is very uncertain). This judgement is made on quality of evidence for the critical outcomes and not those that are not critical for decision-making.

The value of this new approach is that systematic review or randomized control trial (RCT) evidence that is biased, inconsistent, or imprecise may be downgraded from high- to moderate- or low-quality evidence. Similarly, observational data from cohort or case–control studies may be upgraded from moderate or low (as is typical in the old levels-of-evidence approach) to high if bias is unlikely, and findings are consistent and precise. This is very helpful in assessing evidence for cardiovascular disease (CVD) prevention where RCTs of health behaviours are difficult to conduct and may be misleading.

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

The present update from the fifth Joint Task Force (JTF) reflects the consensus on the broader aspects of cardiovascular disease (CVD) prevention from the nine participating organizations (European Society of Cardiology [ESC], European Atherosclerosis Society, European Society of Hypertension, European Society of General Practice/Family Medicine, European Heart Network [EHN], International Society of Behavioural Medicine, European Association for the Study of Diabetes, International Diabetes Federation Europe, and European Stroke Organisation). For more detailed guidance, reference is made to the specific guidelines from the participating societies, which are in full congruence with this

publication.

The Task Force behind the 2012 recommendations has chosen to limit the size to the level of the executive summary of previous JTF publications. All relevant reference material is available on the dedicated CVD Prevention Guidelines page of the ESC Website, www.escardio.org. A one-page summary of all strong recommendations according to the GRADE system will be provided, which may stimulate implementation; and a pocket version will be available for daily clinical use.

The Grading of Recommendations Assessment, Development and Evaluation rating system (GRADE) distinguishes quality of evidence and strength of recommendation. Strong evidence does not automatically lead to a strong recommendation. Recommendations are based on the quality of the evidence, the degree of uncertainty about the balance of benefits and harms of the intervention, uncertainty about the values and preferences of patients, and uncertainty about whether the intervention is a wise use of resources. Rather than have a range of classes of recommendation (e.g., Class I–Class III), GRADE only uses two categories—*strong* or *weak* (i.e., discretionary, conditional). The implications of a strong recommendation are: most informed patients would choose the recommended intervention (and request discussion if not offered); clinicians would ensure that most patients should receive the intervention; and the recommendation would be adopted as policy in organized healthcare systems. In contrast, for weak recommendations, some patients would want the intervention but many would not; clinicians would help patients make choices dependent on their values and preferences; policy makers would require debate among various stakeholders to decide on the role of the intervention.

Rating Scheme for the Strength of the Recommendations

Classes of Recommendations (European Society of Cardiology [ESC] System)

Classes of Recommendations	Definition	Suggested Wording to Use
Class I	Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective.	Is recommended/is indicated
Class II	Conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of the given treatment or procedure.	
<i>Class IIa</i>	<i>Weight of evidence/opinion is in favour of usefulness/efficacy.</i>	Should be considered
<i>Class IIb</i>	<i>Usefulness/efficacy is less well established by evidence/opinion.</i>	May be considered
Class III	Evidence or general agreement that the given treatment or procedure is not useful/effective, and in some cases may be harmful.	Is not recommended

Strength of Recommendation (Grading of Recommendations Assessment, Development, and Evaluation [GRADE] System [adapted])

Strong recommendation - Most informed patients would choose the recommended intervention (and request discussion if not offered); clinicians would ensure that most patients should receive the intervention; and the recommendation would be adopted as policy in organized healthcare systems.

Weak recommendation - Some patients would want the intervention but many would not; clinicians would help patients make choices dependent on their values and preferences; policy makers would require debate among various stakeholders to decide on the role of the intervention.

Cost Analysis

- According to the National Institute of Health and Clinical Excellence (NICE) Prevention of Cardiovascular Disease: Costing Report (2010), implementation of the population approach may bring numerous savings:
 - Cost savings from the number of cardiovascular disease (CVD) events avoided.
 - Cost savings associated with CVD such as medications, primary care visits, and outpatient attendances.
 - Cost savings to the wider economy as a result of reduced loss of production due of illness in those of working age, reduced benefit payments, and reduced pension costs from people retiring early from ill health.
- Only circulating biomarkers assessed by standardized and validated methods (and identified as risk factors worth translating into clinical practice) were considered in these guidelines, in a context of cost-effectiveness for assessment of individual risk in the general population.

- Influenza vaccination as a population-wide prevention measure was associated with a very cost-effective reduction in clinical events.
- After a cardiovascular event, secondary preventive efforts within a structured rehabilitation programme have been shown to be particularly important and cost-effective.
- Although there is evidence that lifestyle changes are likely to be cost-effective, this needs further evaluation.
- Increasing numbers of patients receiving medications may result in higher healthcare costs. However, modelling strategies to use resources efficiently and to identify 70% of the CVD burden in the UK have reported that prioritizing patients by estimated CVD risk may reduce healthcare costs by £45,000 compared with a diabetes and hypertension first strategy.
- Cardiac rehabilitation is considered a cost-effective intervention following an acute coronary event; it improves prognosis by reducing recurrent hospitalizations and healthcare expenditure while prolonging life.
- Investment in additional risk assessment measurements such as imaging with computed tomography to obtain coronary calcium scores may be helpful, but adds considerably to the cost and time involved in risk factor scoring, and its benefit remains unproven.

Method of Guideline Validation

External Peer Review

Internal Peer Review

Description of Method of Guideline Validation

Once the document had been finalized by the fifth Joint Task Force (JTF) experts it was submitted for extensive independent external review. Following this revision and after acceptance by the European Society of Cardiology (ESC) Committee for Practice Guidelines and the co-operating organizations in the fifth JTF, the document was published.

Evidence Supporting the Recommendations

References Supporting the Recommendations

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Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

- Reduction in the incidence of first or recurrent clinical events due to coronary heart disease, ischaemic stroke, and peripheral artery disease
- Prevention of disability and early death
- Prevention of clinical cardiovascular disease

Potential Harms

Smoking Cessation

- Side effects of varenicline are rare, but, due to links with serious adverse events, including depressed mood, agitation, and suicidal thoughts, a psychiatric history and suicide risk assessment should be taken before prescription. Small but significantly increased risk of cardiovascular events associated with the use of varenicline was reported.
- All pharmacological smoking-cessation therapies should be used short term since long-term safety and efficacy data are lacking.

Antihypertensive Drugs

Beta-blockers induce weight gain, have adverse effects on lipid metabolism, and increase (compared with other drugs) the incidence of new-onset diabetes; they should not be preferred in hypertensive patients with multiple metabolic risk factors (i.e., abdominal obesity, impaired fasting glucose, and impaired glucose tolerance), conditions that increase the risk of new-onset diabetes. This also applies to thiazide diuretics, which have dyslipidaemic and diabetogenic effects, particularly when used at high doses.

Lipid-lowering Drugs

- Higher activity of liver enzymes in plasma occurs occasionally with use of statins, and in most cases is reversible: 5% to 10% of patients receiving statins develop myopathy, but rhabdomyolysis is extremely rare.
- Because statins are prescribed on a long-term basis, possible interactions with other drugs deserve particular and continuous attention, as many patients will receive pharmacological therapy for concomitant conditions.
- There are reports indicating increased blood sugar and glycated haemoglobin (HbA_{1c}) levels, i.e., increased risk of type 2 diabetes, as a possible adverse effect of long-term statin therapy, but the benefits of statins far outweigh the risks for the vast majority of patients.
- Flushing is the main adverse effect of niacin, which may affect compliance.
- Other drugs metabolized through cytochrome P450 should be avoided when a combination of a fibrate and statin is prescribed (see Table 17 in the original guideline document). Fibrates should preferably be taken in the morning and statins in the evening to minimize peak dose concentrations and decrease the risk of myopathy. Patients have to be instructed about warning symptoms (myalgia) even though these adverse effects are very rare. Avoiding the addition of gemfibrozil to a statin regimen is advised.

Antithrombotic Therapy

Risk of major bleeding

Contraindications

Contraindications

Dual antiplatelet therapy with a P2Y₁₂ inhibitor (ticagrelor or prasugrel) added to aspirin is contraindicated in patients with excessive risk of bleeding.

Qualifying Statements

Qualifying Statements

- The European Society of Cardiology (ESC) Guidelines represent the views of the ESC and were arrived at after careful consideration of the available evidence at the time they were written. Health professionals are encouraged to take them fully into account when exercising their clinical judgement. The guidelines do not, however, over-ride the individual responsibility of health professionals to make appropriate decisions in the circumstance of the individual patients in consultation with that patient, and, where appropriate and necessary, the patient's guardian or carer. It is also the health professional's responsibility to verify the rules and regulations applicable to drugs and devices at the time of prescription.
- The Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach can be applied to diagnostic strategies in the same way with a few minor changes to the quality criteria used, and may also be used in conjunction with appraisals of resource use and cost-effectiveness. However, as resources are valued differently across Europe, it is not feasible in these guidelines to make judgements about the appropriateness of resource use for the interventions and diagnostic strategies considered here.

Implementation of the Guideline

Description of Implementation Strategy

- The Task Force behind the 2012 recommendations has chosen to limit the size to the level of the executive summary of previous Joint Task Force (JTF) publications. All relevant reference material is available on the dedicated cardiovascular disease (CVD) Prevention Guidelines page of the [European Society of Cardiology \(ESC\) Web site](#) . A one-page summary of all strong recommendations according to the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) system will be provided, which may stimulate implementation; and a pocket version will be available for daily clinical use.
- The partner societies co-operate in the Joint Societies Implementation Committee, which aims to stimulate dissemination of the guidelines, acceptance at national levels, and the formation of national alliances to translate the recommendations into clinical practice. The programme

'Call for Action' was one of the efforts of this committee.

- Implementation has been well accepted at the European Union (EU) political level after the launch of the European Heart Health Charter in the European Parliament in June 2007. This public health statement has been endorsed by a majority of the EU member states, defining the characteristics of people who tend to stay healthy as:
 - No use of tobacco
 - Adequate physical activity: at least 30 min five times a week
 - Healthy eating habits
 - No overweight
 - Blood pressure below 140/90 mmHg
 - Blood cholesterol below 5 mmol/L (190 mg/dL)
 - Normal glucose metabolism
 - Avoidance of excessive stress

Implementation Tools

Chart Documentation/Checklists/Forms

Clinical Algorithm

Foreign Language Translations

Pocket Guide/Reference Cards

Quick Reference Guides/Physician Guides

Slide Presentation

Staff Training/Competency Material

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

Living with Illness

Staying Healthy

IOM Domain

Effectiveness

Patient-centeredness

Identifying Information and Availability

Bibliographic Source(s)

Perk J, De Backer G, Gohlke H, Graham I, Reiner Z, Verschuren M, Albus C, Benlian P, Boysen G, Cifkova R, Deaton C, Ebrahim S, Fisher M, Germano G, Hobbs R, Hoes A, Karadeniz S, Mezzani A, Prescott E, Ryden L, Scherer M, Syvanne M, Scholte op Reimer WJ, Vrints C, Wood D, Zamorano JL, Zannad F. European guidelines on cardiovascular disease prevention in clinical practice (version 2012). *Eur Heart J*. 2012 Jul;33(13):1635-701. [568 references] [PubMed](#)

Adaptation

Not applicable: The guideline was not adapted from another source.

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The disclosure forms of the authors and reviewers are available on the [ESC Web site](#).

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Association of Cardiologists of Bosnia & Herzegovina - Medical Specialty Society

Belgian Society of Cardiology - Medical Specialty Society

Belorussian Scientific Society of Cardiologists - Medical Specialty Society

Cardiology Society of Serbia - Medical Specialty Society

Croatian Cardiac Society - Medical Specialty Society

Danish Society of Cardiology - Medical Specialty Society

Estonian Society of Cardiology - Medical Specialty Society

French Society of Cardiology - Medical Specialty Society

Hellenic Cardiological Society - Medical Specialty Society

Hungarian Society of Cardiology - Medical Specialty Society

Israel Heart Society - Medical Specialty Society

Latvian Society of Cardiology - Medical Specialty Society

Libyan Cardiac Society - Medical Specialty Society

Lithuanian Society of Cardiology - Medical Specialty Society

Luxembourg Society of Cardiology - Medical Specialty Society

Polish Cardiac Society - Medical Specialty Society

Portuguese Society of Cardiology - Medical Specialty Society

Romanian Society of Cardiology - Medical Specialty Society

San Marino Society of Cardiology - Medical Specialty Society

Slovak Society of Cardiology - Medical Specialty Society

Society of Cardiology of the Russian Federation - Medical Specialty Society

Spanish Society of Cardiology - Medical Specialty Society

Turkish Society of Cardiology - Medical Specialty Society

Guideline Status

This is the current release of the guideline.

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Guideline Availability

Electronic copies: Available from the [European Society of Cardiology \(ESC\) Web site](#) . Also available in [Spanish](#) and [Turkish](#) from the ESC Web site.

Print copies: Available from Oxford University Press, Great Clarendon Street, Oxford, OX2 6DP, UK, Tel: +44 (0) 1865 353263, Fax: +44 (0) 1865 353774, Web site: <http://www.eurheartj.oxfordjournals.org/> .

Availability of Companion Documents

The following are available:

- CVD prevention. Fifth Joint European Societies' Task Force on cardiovascular disease prevention in clinical practice. Essential messages. 2012. 10 p. Electronic copies: Available in Portable Document Format (PDF) from the [European Society of Cardiology \(ESC\) Web site](#) .
- European guidelines on CVD prevention summary in general practice. 2012. 2 p. Electronic copies: Available in PDF from the [ESC Web site](#) .
- European guidelines on CVD prevention in clinical practice. Pocket guidelines. 2012. Electronic copies; Available for order form available from the [ESC Web site](#) .
- European guidelines on CVD prevention in clinical practice. Slide set. 2012. Electronic copies: Available to registered users from the [ESC Web site](#) .
- European guidelines on CVD prevention in clinical practice (version 2012). Addenda. 2012. 12 p. Electronic copies: Available in PDF from the [ESC Web site](#) .

Print copies: Available from Oxford University Press, Great Clarendon Street, Oxford, OX2 6DP, UK, Tel: +44 (0) 1865 353263, Fax: +44 (0) 1865 353774, Web site: <http://www.eurheartj.oxfordjournals.org/> .

Additionally, continuing medical education (CME) credit is available online at the [ESC Web site](#) . Relative risk charts (SCORE charts) are available in the [original guideline document](#) .

Patient Resources

None available

NGC Status

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